June 2, 1953 W. F. SANDERS 2,640,563

MEANS OF WITHHOLDING BRAKING ACTION WHEN AN HYDRAULIC BRAKE IS RELEASED

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Fig. 1.

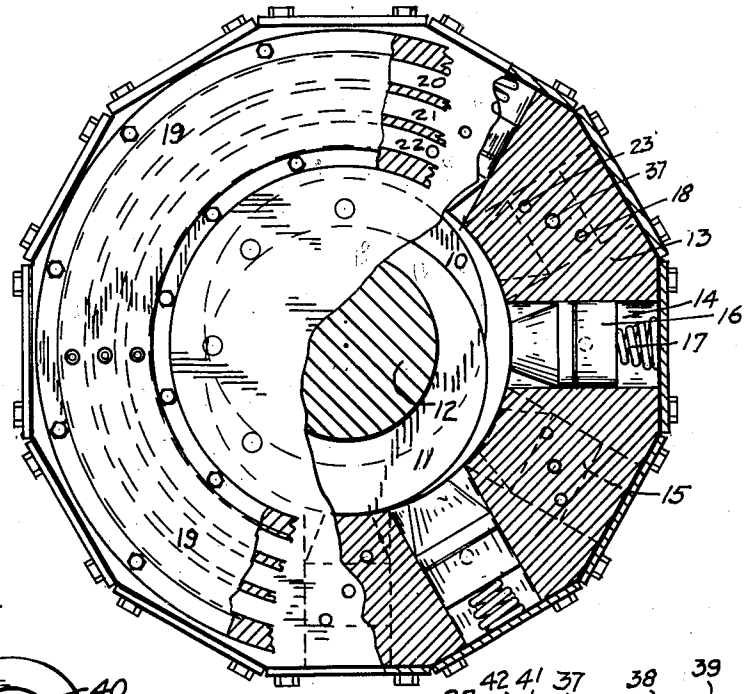
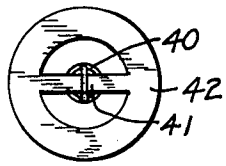


Fig. 4



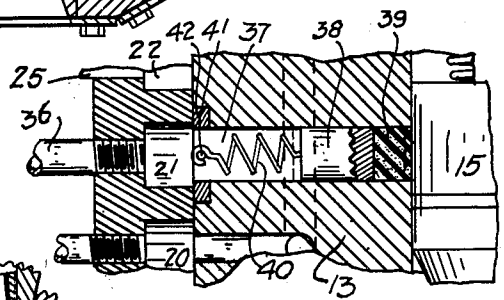


Fig. 3.

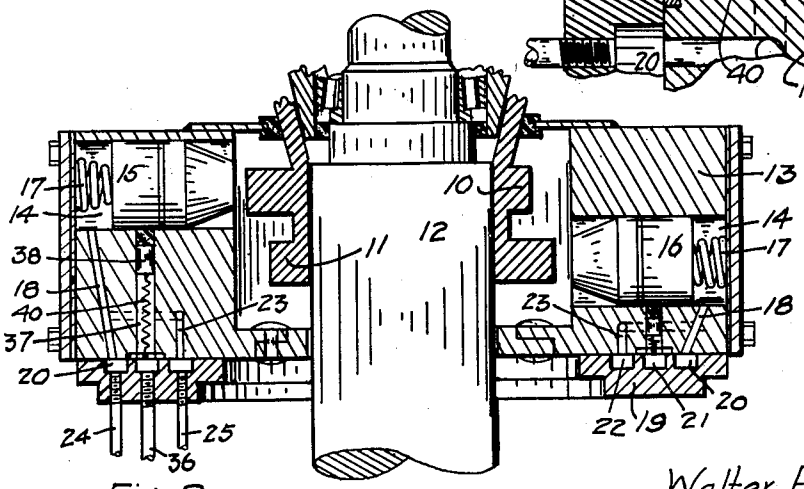


Fig. 2.

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Fig. 5

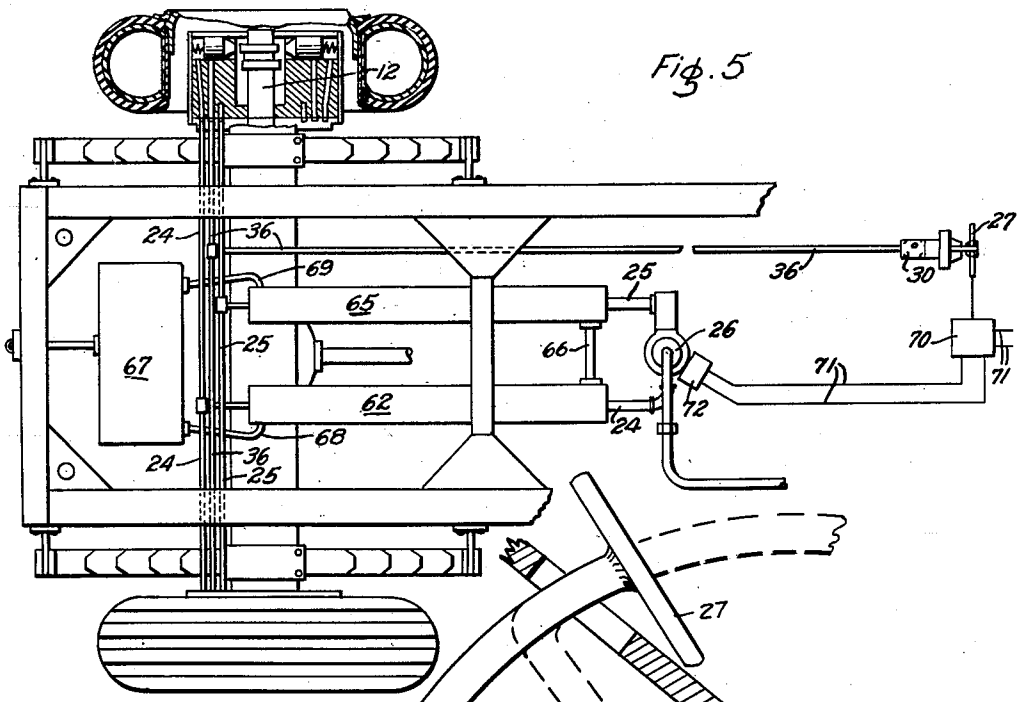
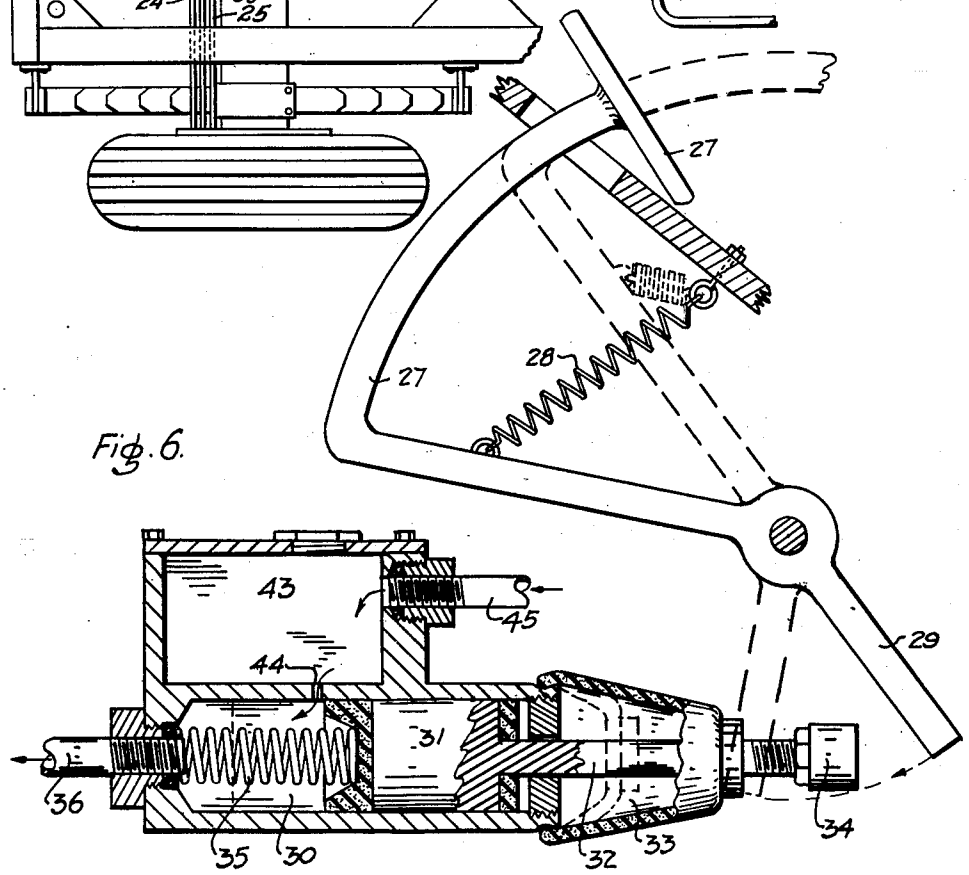


Fig. 6.



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MEANS OF WITHHOLDING BRAKING ACTION WHEN AN HYDRAULIC BRAKE IS RELEASED

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3 Claims. (Cl. 188—91)

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This invention relates to hydraulic brakes of the type which restrain the rotation of a rotating body by the throttling action of a controlled valve on the fluid circulated by the motion of the pistons, and especially the pistons of the brake for which I, jointly with Clifton C. Stevens, have applied for a patent of the United States, under Serial No. 730,244, filed on February 24, 1947, now issued as Patent No. 2,548,919, and more especially to means for holding the pistons thereof in their withdrawn positions when the brake has been released.

The object of my invention is to provide an automatic means which will prevent the pistons from following the retreating movement of the brake cams, thereby releasing the unnecessary pumping action of said pistons on the fluid controlling said brakes.

I attain this and other objects as will be perceived by those familiar with the art, by the devices, mechanisms and arrangements illustrated in the accompanying drawings, in which—

Fig. 1 is an end elevation, partly in section, of the braking mechanism of my improved hydraulic brake; Fig. 2 is a cross-section thereof; Fig. 3 is a section thereof showing my released-brake holder; Fig. 4 is an elevation of the spring-holding washer; Fig. 5 is a plan showing my improved hydraulic brake, as applied to the rear wheels of a truck; and Fig. 6 is a view illustrating the means of operating the released-brake holding mechanism. Identical numerals of reference refer to the same parts throughout the several views.

Referring to the drawings, it will be seen that, briefly, the brake to which my invention is applied, comprises a pair of eccentric circular cams 10 and 11, secured to the rotating axle 12 which rotates within the fixed housing 13, having a plurality of cylinders 14 in which two series of pistons 15 and 16 reciprocate, the pistons 15 being in contact with the cam 10, and the pistons 16 being in contact with the cam 11, all said pistons being urged toward the axle 12 by means of the compression springs 17 mounted between them and the heads of the respective cylinders 14. A suitable fluid fills the cylinders and the passages connected thereto. The cams successively force the pistons outward in the cylinders, against the action of the springs 17, thus forcing the fluid out of the respective cylinders into the high pressure passages 18 in the housing 13.

A manifold comprising a circular ring 19, of rectangular section, is tightly secured to the flat face of the housing 13. The contacting surface

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of the ring 19 is provided with three concentric grooves 20, 21 and 22, each of which forms a manifold for a different set of similar passages in the housing 13 and opening into the respective manifold grooves. The high pressure passages 18 carry the fluid, pressed out of the cylinders 14 by the action of the cams 10 or 11 on the pistons 15 or 16, past suitable check valves (not shown) and into the manifold passage 20 and thence by the high pressure pipes 24 to the receiving side of the valve 26, which is thus common to all the wheel brakes. This fluid passes through the valve 26, substantially without resistance if the said valve 26 is fully open, but with resistance if it is partially or wholly closed, and leaves the said valve 26 by the low pressure pipes 25 to return to the cylinder 14 through the manifold passage 22, and suitable check valves (not shown) and so to the low pressure passages 23, thus filling up the space evacuated by the high pressure fluid. The fluid always travels in the same direction in said passages and pipes and completely fills them and circulates constantly, passing through the valve 26 with more or less resistance according as the driver applies a force to the brake lever 27.

This connection between the lever 27 and the brake valve 26 may be of any of the well-known means such as by means of electrical connection, as by the lever 27 controlling a rheostat 70 which controls the current in the electrical wires 71 which, in turn, controls by suitable well-known means, such as a solenoid 72, the position of the valve 26 in relation to the flow of fluid therepast. Thus, as the pedal 27 is depressed to apply the brakes, the valve 26 is moved to resist the free passage of fluid therethrough and thus a braking force is applied to the pistons 15 and 16.

The said high pressure passages 18 all open into the manifold groove 20, having suitable check valves therein. Similarly, as the pistons are urged inward by the springs 17, the fluid is drawn into the respective cylinders 14 in the housing from the low pressure passages 23 all opening into the low pressure manifold groove 22 and past suitable check valves in the passages 23 receiving the fluid therefrom. The said manifold grooves 20 and 22 in the fixed ring 19 communicate respectively with the pipes 24 and 25 leading to the two sides of the control valve 26, mounted on the chassis and controlling the resistance of the fluid to motion in the said pipes, thereby controlling the resistance of the pistons on all the wheels to motion, under the pressure applied by the motion of the cams 10 and 11. The valve 26 is controlled by the vehicle driver in any ap-

proved manner, not shown. It is evident that when the valve 26 is fully open there is substantially no resistance to the motion of the pistons 15 in the cylinders 14 under the outward impulse of the cams 10 and the inward pressure of the springs 17, however it is plain that such motion is unnecessary and wasteful, and my present invention is for the purpose of eliminating all such motion after the brakes are released by the driver. This is accomplished by holding the pistons 15 at their outermost positions when the brake mechanism is released.

The heat developed in the brakes heats the fluid in the system. I therefore pass the high pressure pipe 24 through a water cooler 62, and the low pressure pipe 25 through a similar water cooler 65. A circulation pipe 66 joins the coolers 62 and 65. A water storage tank 67 is connected to the cooler 62 by a pipe 68, and to the cooler 65 by a pipe 69. The heat developed is therefore largely absorbed by the cooling water in the above cooling system.

In Fig. 6 is illustrated a portion of the brake controlling foot-lever 27 in its depressed, or brake-applying position operating against the tension of the spring 28. The lever 27 has an extension 29. A cylinder 30 is mounted adjacent to the extension 29 and contains a plunger 31, having a rod 32 passing out of the cylinder 30 and through a flexible cap 33 to an adjustable head 34. The plunger 31 is adapted to be pushed in the cylinder against the action of a compression spring 35, by the extension 29, under the action of the spring 28 when the foot-lever 27 is released to release the brake.

The cylinder 30 is provided with an outlet pipe 36 which leads therefrom to the manifold ring 19, above described, where it communicates with the central manifold groove 21.

Referring, now, to Figs. 2 and 3 it will be seen that the housing 13 has a series of passages 37, each of which communicates with the manifold groove 21, and each extends through the housing 13 into the brake cylinders 14 at a point in line with the piston 15 when the piston is in its furthest outward position.

A plug or plunger 38 is mounted in said passage 37 and is provided with a suitable outer section 39, of rubber or other suitable material, which is adapted to engage the piston 15 and to press thereagainst to resist the motion of the piston under the action of the spring 17. The cylinder 30, pipe 36, manifold groove 21 and all the passages 37 are filled with a suitable fluid, so that when the foot-lever 27 is released, to release the brake, and the piston 31 forced outward, as above described, the fluid therein will force the plug 38 against the piston 15 to hold it in its withdrawn position after the cam 10 has forced it thereinto, thus removing it from engagement with the cam, except momentarily, and eliminating all resistance to the rotation of the cams from the brake.

Springs 40 are secured to the plugs 38 and to a bar 41, mounted on a washer 42 fastened between the housing 13 and the ring 19 at each such passage 37.

A chamber 43 is mounted in communication with the cylinder 30, through the passage 44. Said chamber 43 is kept full of the fluid being used, by a supply pipe 45 leading thereto from a reserve tank (not shown).

Thus it will be seen that, when the brake is released by the driver, all the plugs 38 on all the brakes are simultaneously forced against the respective brake pistons, so that as the cams 10 or 11 force the pistons outward, they are held in that extreme outward position against following the inward movement of the cams under the action of the springs 17 by the faces 39 of the plugs 38 engaging the said pistons 15 or 16, thereby freeing the wheels from any resistance to rotation by said brakes.

Having described my invention, what I claim and desire to secure by Letters Patent, is:

1. A means of withholding braking action when an hydraulic brake is released, comprising, in combination with an hydraulic brake adapted to be applied to a rotating body and having a plurality of reciprocating floating pistons mounted in braking cylinders in a fixed housing and actuated by said rotating body against the action of springs, and actuating a flow of fluid, and means to throttle said flow of fluid to resist the motion of the pistons whereby to apply braking action to the rotating body, means in said housing releasably and frictionally engaging said pistons in said cylinders, and means connected to said throttling means adapted to actuate said piston-engaging means, whereby said pistons may be held frictionally at the extreme outer ends of their travel against the action of the springs when said throttling means is released.

2. A mechanism as set forth in claim 1, wherein each said means in said housing and engaging one of said pistons, comprises an hydraulic holding cylinder having a free plug therein adapted to engage said piston whereby, on an increase of the hydraulic pressure in said holding cylinder, said plug is applied frictionally to said piston to prevent its inward motion under the action of one of said springs.

3. A mechanism as set forth in claim 1 wherein said fixed housing has inflow and outflow passages for each braking cylinder, together with a flat ring secured to the face of the housing and having three concentric manifold grooves therein, two of said grooves communicating respectively with all of said inflow and outflow passages and with said throttling means whereby all of the braking pistons are equally and simultaneously resisted when the flow of fluid is throttled, and wherein a holding cylinder is associated with each braking cylinder, together with a plug in each holding cylinder for frictionally engaging the piston, a passage from each holding cylinder communicating with the third manifold groove, and wherein said means connected to the throttling means comprises a hydraulic cylinder with a plunger adapted to be engaged and moved by the throttle actuating means when the latter is released, whereby all of said plugs may be brought into frictional engagement with said braking pistons to hold the latter in disengaged positions against the action of said springs.

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